

Power System Operating Incident Report – Trip of Callide C Units on 21 October 2013

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Version Release History

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1	7 Jan 2014	S Darnell	FINAL	P Biddle	P Biddle

Incident Classifications

Time and date and of incident	2212 hrs Monday 21 October 2013
Region of incident	QLD
Affected regions	QLD
Event type	GG – Loss of Multiple Generating Units
Primary cause	CI – Customer Load Internal Issue
Impact	VS – Very Significant
Associated reports	Nil

Abbreviations

Abbreviation	Term
AEMO	Australian Energy Market Operator
EMMS	Electricity Market Management System
EMS	Energy Management System
kV	Kilovolt
MW	Megawatt
NER	National Electricity Rules

1 Introduction

This report reviews a power system operating incident that occurred on Monday 21 October 2013 in the Queensland region at Callide C Power Station. AEMO is required to review this incident as it is classified as a non-credible contingency that satisfies the requirements of a reviewable operating incident under the National Electricity Rules¹ (NER).

The purpose of this incident review is to assess power system security over the course of the incident. The NER requires AEMO to assess the adequacy of the provision and response of facilities and services and the appropriateness of actions taken to restore or maintain power system security².

This report is largely based upon information provided by Callide Power Trading³. Data from AEMO's Energy Management System (EMS) and Electricity Market Management System (EMMS) has also been used in analysing the incident.

References to time in this report are to National Electricity Market time (Australian Eastern Standard Time).

2 The Incident

On Monday 21 October, at 2212 hrs, Units 3 and 4 at Callide C Power Station tripped. Approximately 392 MW of generation was lost as a result. Both units returned to service the following day at 0400 hrs (Unit 4) and 12:50 hrs (Unit 3).

The primary reason for investigating this incident is to determine why two independent generating units tripped at the same time. Generally, if one generating unit trips, other generating units should remain connected to the power system and continue generating largely unaffected.

3 Participant Investigation

CS Energy⁴ investigated this incident and found that the both units tripped on low feed water flow. The low feed water flow was caused by a loss of boiler control due to low instrument air pressure. Air pressure was in turn low because the station air compressors had tripped, on high temperature, due to the failure of the auxiliary cooling water system.

At Callide C power station the compressed air supply is common to both generating units (Units 3 and 4) and is sourced from three compressors (A, B and C). The cooling water supply for the compressors is supplied from either of the two generating units, each unit having two pumps – Auxiliary Cooling Water Pump A and Auxiliary Cooling Water Pump B.

The sequence of events leading to the Unit trips was triggered by a routine Unit 4 auxiliary cooling water pump changeover – the in-service pump (Pump B) was to be taken out of service for maintenance and replaced by the second pump (Pump A). However, the correct changeover procedure was not followed which triggered a shutdown of both Unit 4 pumps (Pumps A and B). The problem was then aggravated by the failure of two valves which rendered ineffective the automatic change over to the alternate cooling water supply from Unit 3.

The station air compressors (A, B and C) then, in turn, tripped on high temperatures due to lack of cooling water. The generating units then tripped due to effects of low instrument air pressure.

¹ NER v60 Clause 4.8.15(a)(1)(i) and AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents.

² NER v60 Clause 4.8.15 (b)

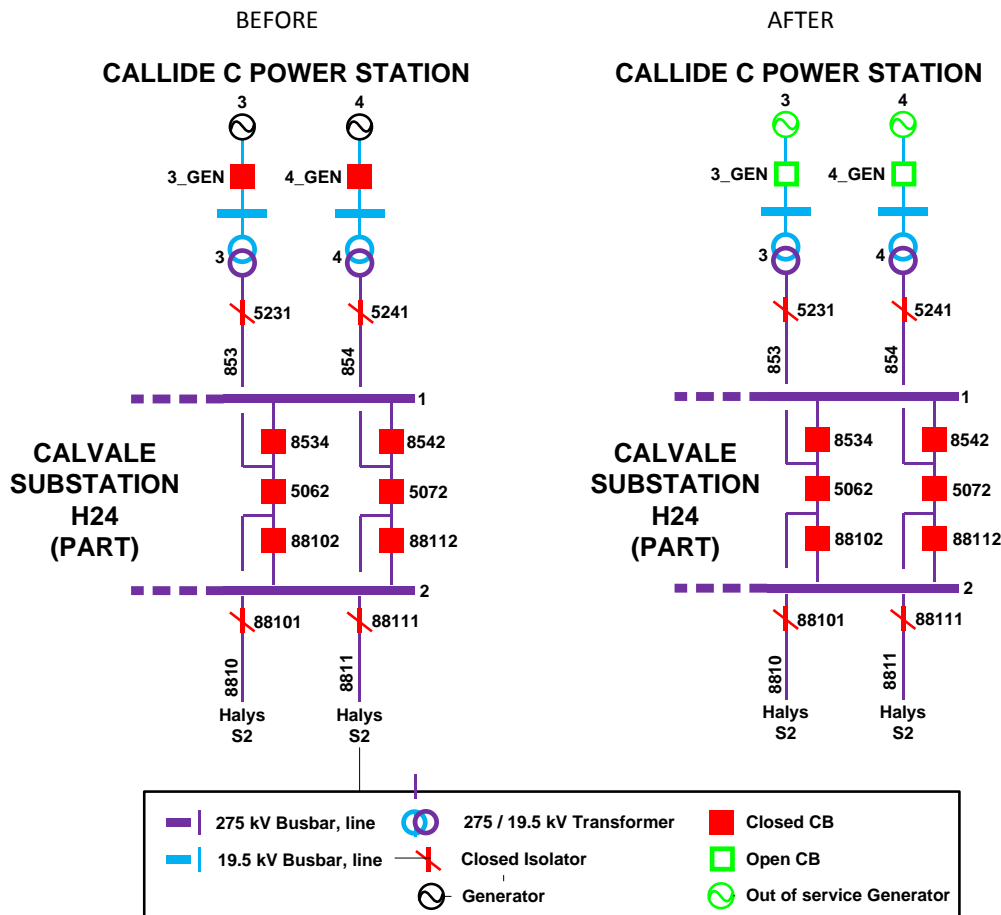
³ Callide Power Trading is the registered participant for Callide C Power Station

⁴ CS Energy is the operator of Callide C Power Station

4 System Diagram

The status of the power system before and after the incident is shown in Figure 1. For clarity only equipment relevant to this incident has been included in the diagrams. The diagram shows both Callide C units in service before the incident and out of service after the incident.

Figure 1 – Power System Diagram



5 Incident Event Log

The sequence of events comprising the incident are itemised in Table 1. The incident spanned approximately 14 hours and 40 minutes from the unit trips to both units being returned to service.

Table 1 – Event Log

Time and Date	Event
22:12 21 Oct 2013	Callide C Unit No.4 tripped from 198 MW
22:13 21 Oct 2013	Callide C Unit No.3 tripped from 194 MW
22:48 21 Oct 2013	Market Notice 43675 issued to notify the market of a non-credible contingency event
03:32 22 Oct 2013	Market Notice 43677 issued to notify the market that AEMO will not reclassify this event as a credible contingency
04:00 22 Oct 2013	Callide C Unit No. 4 resynchronised
12:50 22 Oct 2013	Callide C Unit No. 3 resynchronised

6 Immediate Actions

This section assesses any immediate responses to the incident.

No immediate actions were required to maintain power system security following the trip of the Callide C Units. The transmission system was unaffected, no constraints violated, and no constraints were required to be invoked for the loss of the Callide C generating units.

7 Follow-up Actions

This section assesses any follow-up actions taken to resolve the incident.

AEMO issued Market Notice 43675 at 2248 hrs Monday 21 October 2013, to notify the market of the non-credible contingency event, and that the cause of event was not known at that stage. AEMO issued Market Notice 43675 approximately 36 minutes after the trip of at Callide C Units No. 3 and 4. This was within two hours of the event in which AEMO is required to notify the market of a non-credible contingency event⁵.

AEMO then assessed whether or not to reclassify the event as a credible contingency⁶. For this event AEMO did not reclassify after the trip of Units No. 3 and 4 at Callide C Power Station as a credible contingency. AEMO was satisfied that the cause of the event had been identified and was unlikely to reoccur. AEMO then issued Market Notice 43677 at 0332 hrs on 22 October 2013 to notify the market that:

- the cause of the non-credible contingency event had been identified
- AEMO was satisfied that the event was unlikely to reoccur
- AEMO would not reclassify the event as a credible contingency event

The Callide C units returned to service at 04:00 hrs and 1250hrs on Tuesday 22 October 2013.

8 Power System Security

This section assesses how AEMO managed power system security over the course of the incident⁷.

For this incident the power system remained secure over the course of the incident. Power system frequency and voltages were maintained. The incident was correctly assessed, and not reclassified as a non-credible contingency, and appropriate notifications were issued.

9 Conclusions

1. The trip of Callide C Units 3 and 4 was caused by the loss of the station compressed air supply which was in turn was caused by the loss of the auxiliary cooling water supply. This sequence of events was initially caused by procedural error but was exacerbated by the failure of two water supply valves that rendered the back-up cooling water supply unobtainable.
2. Power system security was maintained over the course of this incident

10 Recommendations

There are no recommendations arising from this incident.

⁵ AEMO, *Power System Security Guidelines*, v54 Section 10.3

⁶ Following a non-credible contingency event AEMO is required to assess whether or not to reclassify the event as a credible contingency (*NER v60 Clause 4.2.3A (c)*) and to report how re-classification criteria were applied (*NER v60 Clause 4.8.15 (ca)*). AEMO has to determine if the condition that caused the non-credible contingency event has been resolved.

⁷ AEMO is responsible for power system security in the NEM and is required to operate the power system in a secure operating state (*NER v60 Clause 4.2.4 (a)*). AEMO must thereby ensure that the power system is maintained in, or returned to, a secure operating state following a contingency event.